thallus, sometimes is found only around the margin and on the under side of the lobes, and sometimes is wanting entirely.

MUENSCHER reports a list of marine algae found on Shaw Island (one of the San Juan group), with notes as to zonal distribution and relative abundance, and a discussion of the ecological factors involved. He finds 54 Rhodophyceae, 31 Phaeophyceae, 15 Chlorophyceae, and 3 Myxophyceae. The plates give the distribution at various points on the island and will be very useful to collectors of algae in the region.

Miss KIBBE reports the presence of a parasitic fungus (*Chytridium alarium*, sp. nov.) on *Alaria fistulosa* collected in Alaska. She examined all of the species of brown algae that were readily available at the Puget Sound Marine Station, and also specimens of *Alaria valida* from Alaska, and did not find any trace of this fungus in any of them. In *A. fistulosa* she found the fungus in various forms in all parts of the plant except the heavy older portions of the stipe.

MISS KARRER finds that some light is thrown on the metabolism of *Nereocystis* by chemical reactions whose results are seen under the microscope. She finds that the cell walls are made up of cellulose and algin, the latter being probably the substance that holds the cells together. She finds that the presence of the inorganic substances (calcium, magnesium, sodium, potassium, chlorine, sulphates, carbonates, phosphates, and iodine) whose presence in the plant have often been shown by analytical chemists can be demonstrated in the cell by using the methods suggested by TUNMANN[3] and MOLISCH[4] with slight modifications.

Miss CLARK reports the acidity of marine algae as determined by titration. She reports that all of the 31 species tested were acid.

LANGDON[5] finds that carbon monoxide is present in the float of the bladder kelp (*Nereocystis*), the quantity varying considerably in different individuals. He finds the presence of carbon dioxide to be only occasional and the quantity minute. He does not find confirmation of previous work tending to show that the quantity of carbon dioxide and of oxygen vary with the time of day. He suggests that since theories of photosynthesis have largely been concerned with carbon monoxide and its reduction product formaldehyde, and with formic acid, of which carbon monoxide may be considered the anhydride, it is possible that the occurrence of carbon monoxide in plant tissues may be more general than has been supposed. Apparently LANGDON'S work is the first demonstration of free carbon monoxide in a living plant. A large plant cavity surrounded by rapidly growing tissue furnishes an unusually favorable opportunity for the investigation of gases taking part in metabolism. The sieve tubes in this plant are in the mycelium-like pith web on the interior surface of

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[3] TUNMANN, O., Pflanzenmicrochemie. Berlin. 1913.

[4] MOLISCH, H., Microchemie der Pflanzen. Jena. 1913.

[5] The substance of this paper has also been published in Jour. Amer. Chem. Soc. **39**:149–156. 1917.

the float. Since the whole surface of the sieve tubes in this portion of the plant is thus exposed to the gas contained in this float, it would seem possible that considerable oxidation of foods is carried on in this internal atmosphere. The gas in this float is shown to contain a little larger percentage of oxygen than air. It may possibly be worth while to consider the presence of carbon monoxide in plants in connection with the wide distribution of oxidases in plant tissue and the possible mechanism of their reaction.[6] LANGDON's thorough demonstration of the presence of carbon monoxide in this cavity is a very important piece of work, and great interest attaches to the possible relation of this gas to the metabolism of the plant.—G. B. RIGG.

Quantitative characters in beans.—By means of a statistical study of pole and bush beans, EMERSON[7] has analyzed the characters causing height variation in *Phaseolus vulgaris*. They are 3 in number and apparently segregate independently after crossing. First is the manner of growth, which is either "determinate" (bush type) or "indeterminate" (pole type), with the indeterminate habit completely dominant in the F_1 generation, and showing the typical 3:1 splitting in the F_2 generation. Such behavior he interprets as the result of a single pair of freely segregating factors behaving in a Mendelian fashion.

TSCHERMAK, using the hybrids *Phaseolus vulgaris*×*P. multiflorus* and the reciprocal, found anomalous splitting in the F_2, since some of the "short" segregates produced "talls" in succeeding generations. He makes no mention of habit of growth, and merely classifies the progenies as "talls" and "shorts." The results of TSCHERMAK need not be compared with EMERSON'S, however, because in the former case the hybrids are interspecific, and in the latter intervarietal (intraspecific).

The second character operative in determining height is number of internodes. The presence of this character was deduced from the fact that different varieties of both pole and bush beans differed in the number of internodes produced when grown under the same conditions. The question then arose as to whether this tendency to produce few or many internodes could be inherited independently of habit of growth. Suitable crosses were made and the results seemed to answer the question in the affirmative, although the evidence is admittedly incomplete. The factors determining this difference could not be shown to be perfectly dominant, but apparent segregation followed hybridization. This segregation was attended in the F_2 generation by a range of variability exceeding that of the 2 parents. EMERSON interprets this result as due to the action of multiple segregating factors.

The third character involved in height is length of internode. The modification of this character by habit of growth made its behavior difficult to study.

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[6] REED, G. B., BOT. GAZ. **62**:53–64. 1916.

[7] EMERSON, R. A., A genetic study of plant height in *Phaseolus vulgaris*. Research Bull. no. 7. Nebr. Agric. Exp. Sta. pp. 73. 1916.

In order to have a standard of comparison between pole and bush bean types, the first 5 internodes were measured and the means computed. For comparison between different varieties of pole beans the mean of the first 5 internodes was used. It was thought that the actual internode length found for some of the bush varieties might not be representative of the potential length which would have been attained by the upper internodes had not the production of a terminal inflorescence hindered further growth. To test this supposition crosses were made between a bush bean with long internodes and a pole bean with short internodes. The resulting hybrid showed an intermediate development in the F_1 and a wide range of variation in the F_2 generation. Bush beans with shorter internodes and pole beans with longer internodes than the parent types exhibited were obtained. Here again the variations were attributed to the action of multiple, non-dominant, independently segregating factors.

In conclusion, the author points out that the results of other investigators tend to show that quantitative characters in plants are inherited in two ways: (*a*) they are due to the action of a single Mendelian pair of factors showing complete dominance in the F_1 and a 3:1 ratio in the F_2 generation; (*b*) they exhibit an intermediate development in the F_1 and a wide range of variation in the F_2 generation. In class (*a*) belongs the determinate as opposed to the indeterminate habit of growth. Characters such as length and number of internodes fall into class (*b*). Such characters as those of class (*b*) have been interpreted in 2 ways. EMERSON, TSCHERMAK, EAST, and others attribute them to the interaction of many independently segregating factors, a theory in accord with the multiple factor hypothesis of NILSSON-EHLE. CASTLE, however, has interpreted such behavior as due, in some cases, to the modification of a unit factor through hybridization. In the case of the bean crosses, EMERSON implies that the factor involved would be that which determines habit of growth. After discussing this latter hypothesis and the assumptions its adoption would necessitate, he rejects it in favor of the multiple factor hypothesis.

Since, therefore, the characters involved in producing an effect seem to behave in different manners in inheritance, the author explains the variation in height following hybridization between pole and bush beans as due to the modification of the expression of a unit factor by the presence or absence of a number of factors producing other effects (as, for example, the effect of the determinate habit of growth on the potential length of internodes and on the number of internodes, etc.). However, the author disavows any intention of maintaining that this is the only possible explanation, and suggests that it may have to be modified to suit the results of further selection and hybridization experiments.—WILBUR BROTHERTON.

Philippine forests.—Our knowledge of the economic importance and the environmental conditions of some tropical forests has been advanced by a